

**Conservation Strategy Alternative Bundle Descriptions**  
**April 30, 2007**

The conservation elements are grouped into 22 bundles of related elements. Groups of bundles are put into four categories:

- Water Operations and Conveyance Bundles
- Entrainment and Predation Mortality Reduction Bundles
- Flow-Related Habitat Improvement Bundles
- Physical Habitat Restoration Bundles

**Water Operations and Conveyance Bundles**

1. Real-time operation of CVP/SWP pumps to minimize entrainment of fish during sensitive time periods
  - a. Operate CVP/SWP pumps in real time, based on fish monitoring data, to minimize entrainment of fish during sensitive time periods
  - b. Reduce reverse flows in Old River and Middle River (net westward flow)
2. Reduced water demand and Delta diversions
  - a. Reduce water demand and diversions from the Delta
  - b. Reduce reverse flows in Old River and Middle River (net westward flow)
3. Export water opportunistically
  - a. Increase CVP/SWP pumping capacity to take advantage of high flow episodes with pumping limited at other times when covered species are least vulnerable to entrainment and no pumping at times they are most vulnerable to entrainment
  - b. Provide flows that improve flow-related habitat conditions that mimic historical hydrological patterns (e.g. fluctuating salinity, east-west flow)
  - c. Increased conveyance capacity south of Delta and additional south-of-Delta storage facilities and infrastructure to opportunistically store high flows, including concurrent improvements to louver facilities in order to minimize fish mortality
4. Construct and Operate SDA Facilities
  - a. Construct and operate a peripheral aqueduct ("South Delta Aqueduct"), with state of the art screening, from the Sacramento River (near Hood) with discharge into the lower San Joaquin River. Diverting water from the Sacramento River near Hood will allow salinities to fluctuate in the western, northern, and eastern Delta. Discharging Sacramento River water into the lower San Joaquin River will improve water quality conditions (e.g., DO) for covered species in the south Delta.
  - b. Operate the Delta to reestablish fluctuating hydrologic conditions (salinity, flow, temperature), that benefit covered fish species, in the northern, western, eastern and central Delta, including re-operation of upstream storage facilities to support Delta operations
5. Construct and Operate an Isolated Facility
  - a. Construct and operate an isolated facility (IF) (i.e., "peripheral canal"), with state of the art screening, from the Sacramento River (near Hood) directly to the pumps to isolate the Delta from CCF and the SWP/CVP pumps.
  - b. Operate the Delta to reestablish fluctuating hydrologic conditions (salinity, flow, temperature), that benefit covered fish species, throughout the Delta, including re-operation of upstream storage facilities to support Delta operations
6. Construct and operate a bifurcated SDA

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- a. Construct and operate a peripheral aqueduct from the Sacramento River (near Hood), with state of the art screening, that is bifurcated at the discharge end: one split discharges into the CCF and isolates the SWP and CVP pumps (smaller discharge than under CSA 5), and the other split discharges into lower San Joaquin River (smaller discharge than under CSA 4). Diverting water from the Sacramento River near Hood will allow salinities to fluctuate throughout the Delta. Discharging Sacramento River water into the lower San Joaquin River will improve water quality conditions (e.g., DO) for covered species in the south Delta.
  - b. Operate the Delta to reestablish fluctuating hydrologic conditions (salinity, flow, temperature) that benefit covered fish species, including re-operation of upstream storage facilities to support Delta operations in northern, western, eastern, and central Delta.
  - c. Limited exports continued from existing South Delta facilities
7. Construct and Operate Dual Conveyance Facilities
- a. Improvements/maintenance of through-Delta conveyance facilities (e.g., reinforcing levees, dredging to maintain channel capacity).
  - b. Construct and operate a peripheral aqueduct, of lesser capacity than under CSA 5, from Sacramento River (near Hood) directly to the pumps to isolate the Delta from CCF and the SWP/CVP pumps.
  - c. Operate the Delta to reestablish fluctuating hydrologic conditions (salinity, flow, temperature) that benefit covered fish species, though not to the extent under CSA 4 and 5, including re-operation of upstream storage facilities to support Delta operations
8. Isolate San Joaquin River flows from through-Delta conveyance and SWP/CVP Intakes
- a. Divide the Old River channel to allow San Joaquin River flow to be separated from Victoria Canal water supply flows. Install structures to regulate flows so that San Joaquin River flows are separated from the pumps and are allowed to pass to the central Delta.
  - b. Reconfigure in-Delta conveyance to create a water supply corridor toward the SWP and CVP using the DCC, rock barriers, floodgates, siphons, and pumps.
  - c. Operate Split Delta conveyance facilities to provide transport flows for juvenile Delta smelt and improve salinity conditions for estuarine fish along the lower San Joaquin River to Franks Tract

### Entrainment and Predation Mortality Reduction Bundles

9. Minimize fish mortality associated with entrainment at SWP/CVP intakes
- a. Improvements to louver facilities at SWP and CVP pumps to minimize fish mortality
  - b. Improve the SWP/CVP salvage collection, handling, transportation, and release (CHTR) processes to increase survival
  - c. Improve facilities and pumping operations to minimize passage of fish into Clifton Court Forebay (CCF)
  - d. Modify in-channel habitat structure at SWP/CVP facilities to reduce conditions that support predation of native fishes
10. Minimize entrainment at non-SWP/CVP diversions
- a. Removal and consolidation of in-Delta diversions to minimize entrainment losses of fish
  - b. Improve ineffective screens on diversions within the Delta
  - c. Screen un-screened in-Delta diversions
11. In locations where covered fishes are highly vulnerable to predation, improve/create habitat conditions that will reduce predation levels.
12. Isolate captured gravel pits upstream of Delta
13. Install screens on river diversions upstream of Delta

## REVISED DRAFT HANDOUT #1 BUNDLE DESCRIPTIONS

### Flow-Related Habitat Improvement Bundles

14. Operate the Delta Cross Channel (DCC) to improve passage
  - a. Operate the Delta Cross Channel (DCC) to improve passage of Sacramento River steelhead and salmon and to minimize adverse effects on Sacramento River fish, associated with those fish moving into the Central Delta
15. Open the DCC and install screens at the DCC and Georgiana Slough
16. Re-operate upstream storage facilities to improve riverine and Delta habitats
  - a. Re-operate upstream storage facilities for cold water pool management for the benefit of riverine fish
  - b. Re-operate upstream storage facilities to improve Delta in-flow for the benefit of estuarine fish
  - c. Re-operate upstream storage facilities to improve in-stream flows for the benefit of riverine fish
17. Improve and create bypass and floodway habitat (e.g. Yolo Bypass, Cosumnes Floodway)
  - a. Manage bypasses and restore floodways within and upstream of the Delta to improve habitat conditions for covered fish species
  - b. Modify operations to support bypass flooding for fish spawning and rearing

### Physical Habitat Restoration Bundles

18. Restore physical habitat in the North, East, and West Delta
  - a. Design in-Delta levee maintenance projects to incorporate features that improve in-channel habitat conditions (e.g., establishment of riparian vegetation on levee slopes to provide shaded riverine aquatic (SRA) habitat overhead cover; creation of levee benches to create shallow inter-tidal and subtidal habitat areas; incorporation of large wood debris into riprap within the intertidal and subtidal portions of the levee cross section). Actions of this measure are limited to opportunities presented by levee maintenance needs.
  - b. Extensive in-Delta levee setbacks to establish intertidal and subtidal aquatic and floodplain habitats in important areas used by covered fish species.
  - c. Extensive restoration of aquatic and floodplain habitats on existing farmed islands by breaching levees to reintroduce tidal flow and elevating island interiors to elevations that will support desired habitats for covered species. Diverse island habitats will be designed to ensure that the full range of habitat conditions required for covered fishes is established and to create conditions that will maximize food production. Location of restorations will depend on operations.
19. Restore physical habitat in the Central Delta  
(same elements as #18)
20. Restore physical habitat in the South Delta  
(same elements as #18)
21. Restore Suisun Marsh habitat
  - a. Breach dikes in Suisun Marsh to reestablish tidal exchange and create tributary channels necessary to create high quality intertidal marsh and aquatic habitats.
  - b. Modify operations of salinity control structures in Suisun Marsh to improve flow-related habitat conditions for covered fish in the Marsh.
22. Restore and provide access to spawning and rearing habitat upstream of Delta
  - a. Restore salmonid spawning habitats, including gravel augmentation; provide for channel meander to enhance inputs of spawning gravels; install barriers to separate Chinook runs

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**BUNDLE DESCRIPTIONS**

- b. Expand river floodplain habitat, including creation and expansion of new floodways to restore rearing habitat and splittail spawning habitat
- c. Remove bank protection to reestablish channel and floodplain connectivity and associated processes that support creation and maintenance of spawning and rearing habitat
- d. Restore riparian habitat including shaded riverine aquatic cover
- e. Improve passage and access to upstream habitats, including removing, modifying, or bypassing barriers